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IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF	:
JUN GAO, ET AL.	: EXAMINER: SALVITTI, MICHAEL
SERIAL NO: 10/566,248	:
FILED: MAY 26, 2006	: GROUP ART UNIT: 1796
FOR: METHOD FOR PRODUCING AQUEOUS POLYMER DISPERSIONS	:

APPEAL BRIEF

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

The following is an appeal of the Final Rejection of Claims 1, 4-11, and 14-22 in the above identified application set forth in the Official Action mailed April 1, 2009. A Notice of Appeal was filed on August 3, 2009.

I. REAL PARTY IN INTEREST

The real party of interest is BASF SE located in Ludwigshafen, Germany, by virtue of the assignment recorded in the U.S. Patent and Trademark Office on August 31, 2009, reel/frame 023168/0762.

II. RELATED APPEALS AND INTERFERENCES

Appellants, Appellants' legal representative and their assignee are not aware of any appeals or interferences which will directly affect or be directly affected by or having a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

Claims 1, 4-11, and 14-22 are the only claims pending in the above-identified application.

Claims 1, 4-11, and 14-22 are rejected and appealed.

Claims 2-3 and 12-13 are cancelled.

IV. STATUS OF AMENDMENTS FILED UNDER 37 C.F.R. § 1.116

An Amendment under 37 C.F.R. § 1.116 has been filed on July 1, 2009. The Examiner indicated in the Advisory Action of July 15, 2009 that the amendments had been entered. A copy of the appealed claims is attached as an appendix (IX).

V. SUMMARY OF THE CLAIMED SUBJECT MATTER

The invention of claim 1, the only independent claims which is appealed, is directed to a process for the preparation of an aqueous polymer dispersion by free radical aqueous emulsion polymerization [**page 1, lines 3-4**] comprising polymerizing at least one ethylenically unsaturated compound (monomer) in the presence of at least one dispersant [**page 1, lines 4-5**], wherein

- a) into a reaction vessel at a temperature which is less than or equal to the starting reaction temperature T_s [**page 1, lines 7-8**],
- a₁) at least one portion of demineralized water [**page 1, line 9**],

- a₂) at least one portion of at least one oil-soluble free radical initiator **[page 1, line 10]**,
- a₃) at least one portion of at least one dispersant **[page 1, line 11]**,
- a₄) optionally, a portion of the at least one monomer **[page 1, line 12]** and
- a₅) optionally, a portion of at least one water-soluble free radical initiator are initially added to form a reaction mixture in the reaction vessel **[page 1, lines 13-14]**, thereafter
- b) the reaction mixture obtained is, optionally, heated to the starting reaction temperature T_s , **[page 1, lines 15-16]** and thereafter
- c) the following are metered into the reaction mixture **[page 1, line 17]**:
 - c₁) optionally, the remaining amount of demineralized water **[page 1, line 18]**,
 - c₂) optionally, the remaining amount of the at least one oil-soluble free radical initiator **[page 1, lines 19-20]**,
 - c₃) optionally, the remaining amount of the at least one dispersant **[page 1, line 21]**,
 - c₄) the total amount or, optionally, the remaining amount of the at least one monomer **[page 1, lines 22-23]** and
 - c₅) the main amount of the at least one water-soluble free radical initiator **[page 1, line 24]**, and
- d) the reaction mixture is heated to an end reaction temperature T_E during the metering of the at least one monomer, **[page 1, lines 25-26]** and wherein
the at least one water-soluble free radical initiator has a solubility of $\geq 1\%$ by weight at 20°C and atmospheric pressure in demineralized water **[page 7, lines 16-19]**, and the at least one oil-soluble free radical initiator has a solubility of $< 1\%$ by weight under the process conditions **[page 7, lines 19-21]** and the total amount of water being such that the aqueous

polymer dispersion obtained has a solids content of from 20 to 70% by weight [page 9, lines 23-24],

the at least one water-soluble free radical initiator initiates a free radical polymerization reaction of the at least one monomer at the starting reaction temperature T_s [page 8, lines 5-7], and

at least one oil-soluble free radical initiator has a half-life of ≥ 10 hours at the starting reaction temperature T_s and a half-life of ≤ 5 hours at the end reaction temperature T_E [page 9, lines 1-3].

No means plus function or step plus function as permitted by 35 U.S.C. 112, sixth paragraph, are used and therefore none are identified. (37 C.F.R. 41.37 c(1)(v)).

VI. GROUND OF REJECTION TO BE REVIEWED ON APPEAL

Rejection 1. The rejection of Claims 1, 4-11, and 14-22 under 35 U.S.C. 103(a) over Costanza et al., US 4,003,871.

Rejection 2. The rejection of Claim 5 under 35 U.S.C. 103(a) over Costanza et al., US 4,003,871 and Gluck et al., US 5,908,872.

VII. ARGUMENTS

“The prior art can be modified or combined to reject claims as *prima facie* obvious as long as a person of ordinary skill in the art would have been motivated to combine the prior art to achieve the claimed invention and that there would have been a reasonable expectation of success.” *DyStar Textilfarben GmbH & Co. Deutschland KG v. C.H. Patrick Co.*, 464 F.3d 1356, 1360, 80 USPQ2d 1641, 1645 (Fed. Cir. 2006). If any of these findings [i.e., motivation to combine with a reasonable expectation of success] cannot be made, then this rationale cannot be used to support a conclusion that the claim would have been obvious to

one of ordinary skill in the art. *See KSR International v. Teleflex, Inc.*, 127 S.Ct 1727 (2007).

Rejection 1: The rejection of Claims 1, 4-11, and 14-22 under 35 U.S.C. 103(a) over Costanza et al., US 4,003,871.

The Examiner's decision must be reversed for the following fundamental reasons:

(A) The Examiner erred that the cited references describe or suggest (1) adding at least a portion of a dispersant to at least a portion of water containing at least a portion of an oil-soluble free radical initiator (as in step a3 of claim 1); (2) that a water soluble initiator is active at T_S and an oil-soluble initiator is inactive at T_S ; (3) increasing a polymerization temperature from T_S to T_E (during which the oil-soluble free radical initiator becomes more active and, therefore, a polymerization efficiency is increased with the increase of the temperature); and (4) $T_E \geq T_S + 10^\circ\text{C}$ (as in claim 4).

(B) The Examiner has not established that a person of ordinary skill in the art would have been motivated to conduct the polymerization of Costanza et al. in the same order (a-d) and to increase a polymerization temperature from T_S to T_E as in the claimed method.

(C) The Examiner has not established that a person of ordinary skill in the art would have been motivated to have $T_E \geq T_S + 10^\circ\text{C}$.

The mechanism of polymerization of the claimed method

The claimed invention is directed to a one step polymerization process of aqueous polymer dispersions producing a low residual monomer content and having a high conversion rate (page 3 of the present specification). The claimed process comprises:

(i) At least a oil-soluble initiator, water and a dispersant are mixed at a starting temperature T_S or lower. Monomers and a water-soluble initiator may or may not be added to the mixture thereafter. However, a dispersant must be added prior to metering monomers into the reactor as will be explained further.

(ii) The obtained mixture is heated to the starting reaction temperature T_S (e.g., if the temperature is lower than T_S) and the monomers (the total amount or the remaining amount) are continuously metered into the mixture. The total or main amount of the water-soluble initiator is also added to the mixture.

(iii) The *polymerization is started by the water-soluble initiator at T_S* (i.e., a water-soluble free radical initiator has a solubility of $\geq 1\%$ by weight at 20°C and atmospheric pressure in demineralized water) and the *temperature is raised from T_S to T_E* and the monomers are continuously fed into the reaction mixture *while* the temperature is increased. The *oil-soluble initiator is inactive at the starting reaction temperature* (i.e., the oil-soluble initiator has a half-life of ≥ 10 hours at the starting reaction temperature T_S) and becomes more active as a temperature approaches the end reaction temperature at which the oil-soluble initiator is fully active (i.e., a half-life of ≤ 5 hours at the end reaction temperature T_E). Polymer particles are formed during this stage of the polymerization. The oil-soluble initiator is also a part of the polymer particles (see an explanation below).

(iv) Thus, when the reaction temperature reaches the end reaction temperature T_E , the oil-soluble initiator becomes fully active (i.e., a half-life of ≤ 5 hours at the end reaction temperature T_E) and the polymerization of residual unreacted monomer units (within the polymer particles) is carried out by the oil-soluble initiator within the polymeric particles.

As illustrated by the Examples of the present specification, the claimed one-step process produces aqueous polymer dispersions having a low residual monomer content (pages 18-20). For example, the Example on pages 17-18 shows that 5% of the feed I was initially added at $20\text{--}25^\circ\text{C}$ and heated to 95°C . On reaching 95°C , the remaining amount of the feed I and the total amount of feeds II and III were metered into the reactor with constant feed streams during 90 min.

Concerning a dispersant and emulsion polymerization, *first*, a dispersant, water and an oil-soluble initiator are mixed to solubilize the oil-soluble initiator in water and *then* monomers and a water soluble initiator can be added. More specifically, adding a dispersant to water creates micelles and also monomer droplets become ‘emulsified’ by the dispersant. If the dispersant is not used, the oil- soluble initiator would not be homogeneously dissolved into an aqueous phase during the polymerization. The oil-soluble initiator is at least partly dissolved into micelles (i.e., the oil-soluble initiator is enclosed into a micelle like in a cave) and the emulsion polymerization takes place in the micelles when monomers are added. During the polymerization, monomer molecules forming large emulsified monomer droplets *migrate through the aqueous phase* into the micelles where the polymerization takes place. The oil-soluble initiator and growing polymeric chains are incorporated into the micelles to build up polymeric particles during the emulsion polymerization.

Notes: (1) The Examiner is of the opinion (page 4, the final Official Action of April 1, 2009) that step c₄ is optional and, therefore, is given little patentable weight. Applicants respectfully disagree because in c₄ either the total or the remaining amount of monomers is added.

(2) Further, the Examiner has alleged (page 6, last paragraph, the final Official Action of April 1, 2009) that the amount of the dispersant in step a₃ in claim 17 can be “zero” percent in the reaction vessel prior to the monomer metering. Applicants respectfully disagree because claim 17 depends upon claim 1 which requires adding at least one “portion” of at least one dispersion.

“A portion” cannot be “zero” because if it is “zero” then a portion is not added. Thus, although claim 17 limits the amount of the dispersant to “equal or less than 50 wt.%”, the amount of the dispersant in claim 17 cannot be “0” because claim 1 requires adding at least

“a portion” of the dispersant and claim 17 comprises all limitations of claim 1 from which it depends and further limits the content of the dispersant to be equal or less than 50 wt.%.

A disclosure of Costanza et al.

Costanza et al. describe a process for preparing high solid content aqueous styrene-butadiene polymer emulsions (col. 1-2) comprising:

- a) (i) A pre-emulsion is formed comprising water, all polymerization monomers, and a surfactant (dispersant) (col. 2, lines 10-23, and Example 3). The pre-emulsion is mixed at an ambient temperature *prior* to the metering into the reactor (10-40 °C, col. 3, lines 46-52).
- (ii) A lypophilic (oil-soluble) and hydrophilic (water-soluble) initiators are added to the pre-emulsion (Example 3). Thus, a mixture of monomers, a surfactant, an oil-soluble and a water-soluble) initiators, and water is formed.
- b) Separately from the mixture (a), a polymerization reactor is charged with water and a lypophilic (oil-soluble) initiator and is heated to 50 °C (col. 2, lines 28-32; col. 5, line 51 to col. 6, line 56; Example 3, and claim 1).
- c) The pre-emulsion (a) is added to the reaction medium (b) in the reactor and the temperature is maintained during the initiation and the polymerization reactions (e.g., at 50 °C) (col. 2, lines 32-35; and Examples 1-4).

Distinguishing the claimed method and the method of Costanza et al.

General description.

(1) In Costanza et al., a pre-emulsion comprising water, polymerization monomers, and a surfactant is formed, then oil-soluble and water-soluble initiators are added to the pre-emulsion, and the resultant mixture is metered into the reactor containing water and an oil-soluble initiator at a constant temperature (e.g., 50 °C).

In the claimed process, water, at least a portion of a dispersant and an oil-soluble initiator are first added to a reactor (monomers and a water-soluble initiator are optional at

this stage). Then a temperature is raised, if required, to a starting temperature T_S , and remaining water, the oil-soluble initiator, and dispersant, and the total or remaining amount of monomers and the main amount of the water-soluble initiator is metered in the reactor while the reaction temperature is raised from T_S to T_E . Thus, the polymerization of Costanza et al. and the claimed process are greatly different.

The Examiner has alleged on page 4, last paragraph of the Final Official Action of April 1, 2009 that the order of conducting the reaction is not important because all components are in the reaction solution before the reaction begins. Applicants respectfully disagree because there are many polymerization schemes exist each achieving a different goal, yield of polymers, different quality of polymers, purity, molecular weight, branching, etc. In the claimed method, for example, the polymerization is initiated by a water-soluble initiator and continued by an oil-soluble initiator inside the formed polymer particles at a higher temperature, while in Costanza et al. both initiation and polymerization is conducted at one temperature. Further in Costanza et al., the reactor is not charged with at least water, a dispersant, and an oil-soluble initiator prior to metering and the temperature is not raised during the polymerization. It is know that polymerization conditions greatly affect the result of polymerization.

Thus, the Examiner has not established that a person of ordinary skill in the art would have been motivated to conduct the polymerization of Costanza et al. in the same order (a-d) and to increase a polymerization temperature from T_S to T_E as in the claimed method, while Costanza et al. explicitly describe different conditions and reactions optimized for achieving a specific goal.

Specific differences.

(2) Costanza et al. describe adding both water soluble and oil-soluble initiators containing no dispersant into the initial charge, while in the claimed method requires introducing at least a portion of a dispersant into the initial charge.

Thus, Costanza et al. do not describe adding at least a portion of a dispersant to at least a portion of water and at least a portion of an oil-soluble free radical initiator (as in step a3 of claim 1) to form micelles with the oil-soluble free radical initiator.

(3) Further, the Costanza et al. water soluble and oil-soluble initiators are both active at the same temperature (e.g., 50 °C as in Example 3), while in the claimed method, the polymerization is started by a water-soluble initiator at T_S , at which the oil-soluble initiator is inactive.

Thus, Costanza et al. do not describe or suggest that a water soluble initiator is active at T_S and an oil-soluble initiator is inactive at T_S .

(4) Also, Costanza et al. describe that the pre-emulsion is metered into a reactor when the reactor is maintained at the same temperature during the initiation and polymerization steps (e.g., 50 °C as in Example 3). Costanza et al. do not describe increasing a temperature during metering monomers so that the oil-soluble initiator becomes active and conducts a polymerization of residual unreacted monomers inside the polymeric particles.

Thus, although Costanza et al. describe using a mixture of oil-soluble and water-soluble initiators, the polymerization process is conducted at one temperature by both water- and oil-soluble initiators, while in the claimed process, the water-soluble initiator starts polymerization at a temperature T_S and the oil-soluble initiator completes polymerization when the polymerization temperature approaches T_E .

Thus, the Examiner has not established that a person of ordinary skill in the art would have been motivated to conduct the polymerization of Costanza et al. in the same order (a-d) and to increase a polymerization temperature from T_S to T_E as in the claimed method.

(5) The Examiner has not established that a person of ordinary skill in the art would not have been motivated to have $T_E \geq T_S + 10^\circ\text{C}$.

The Examiner has alleged that it would have been obvious to elevate a temperature in the Costanza et al. polymerization process to $T_E \geq T_S + 10^\circ\text{C}$ with the motivation of reaching substantial reaction completion (page 5, first paragraph, the final Official Action of April 1, 2009). The Examiner has pointed to col. 7, lines 6-8 for support. However, col. 7, lines 6-8 merely describes that a temperature may be varied as the reaction proceeds towards substantial completion and does not describe that substantially completed polymerization is a result of varying the temperature or that the temperature should satisfy the claimed relationship. Thus, the Examiner has not established that a person of ordinary skill in the art would not have been motivated to have $T_E \geq T_S + 10^\circ\text{C}$.

Also, modifying a reaction temperature is not routine. Specifically, for optimizing the reaction temperature, the prior art must first recognize a particular parameter as a result-effect variable, i.e., that improved polymerization efficiency is a function of increasing a polymerization temperature from T_S to T_E during which the oil-soluble free radical initiator becomes more active. MPEP 2144.05. II, *e.g.*, *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977). Costanza et al. do not recognize these dependencies. In fact, a temperature increase is not even required (see Example 3 referred to by the Examiner).

(6) The Examiner has also asserted that Applicants argued that shifting a temperature from T_S to T_E increases the polymerization efficiency but the claims do not recite the polymerization efficiency (see paragraph (C) of the Advisory Action of July 15, 2009).

However, the essence of the Applicants' argument is that the claimed process uses two different temperatures at which two different initiators are active and not the efficiency of the process. Also, the mechanism of polymerization in the presence of water-soluble and oil soluble initiators are known and it is known that the polymerization efficiency is increased

when an oil-soluble free radical initiator completes polymerization in the polymers particles. Thus, reciting the polymerization efficiency in the claims is not necessary. Appellants refer to “efficiency” only to illustration of how an oil-soluble initiator works.

(7) Also, the Examiner has alleged that “activating” an initiator is not recited in the claims. Applicants respectfully disagree because the limitation “the at least one water-soluble free radical initiator initiates a free radical polymerization reaction of the at least one monomer at the starting reaction temperature T_S , and at least one oil-soluble free radical initiator has a half-life of ≥ 10 hours at the starting reaction temperature T_S and a half-life of ≤ 5 hours at the end reaction temperature T_E ” (as in claim 1) means that the water soluble initiator is active at T_S and the oil-soluble initiator is inactive at T_S , and increasing a polymerization temperature from T_S to T_E during causes the oil-soluble free radical initiator to become more active.

(8) The Examiner has also asserted that the claims do not recite that the oil-soluble initiator becomes active to conduct a polymerization inside the polymer particles (paragraphs (I)-(J) of the Advisory Action). However, this mechanism is well known and one of ordinary skill in the art knows how emulsion polymerization works. Thus, it is not necessary to recite the known mechanism in the claims. Moreover, the limitation “the at least one water-soluble free radical initiator initiates a free radical polymerization reaction of the at least one monomer at the starting reaction temperature T_S , and at least one oil-soluble free radical initiator has a half-life of ≥ 10 hours at the starting reaction temperature T_S and a half-life of ≤ 5 hours at the end reaction temperature T_E ” (as in claim 1) means that the water soluble initiator is active at T_S and the oil-soluble initiator is inactive at T_S , and increasing a polymerization temperature from T_S to T_E during polymerization causes the oil-soluble free radical initiator to become more active.

Appellants would like to clarify the mechanism of polymerization in the presence of water-soluble and oil soluble initiators for the Examiner. The oil-soluble initiator is at least partly dissolved into micelles (i.e., the oil-soluble initiator is enclosed into a micelle like in a cave) and the emulsion polymerization takes place in the micelles when monomers are added. During the polymerization, monomer molecules forming large emulsified monomer droplets migrate through the aqueous phase into the micelles where the polymerization takes place. The oil-soluble initiator and growing polymeric chains polymerized with a water-soluble initiator are incorporated into the micelles to build up polymeric particles during the emulsion polymerization. The oil-soluble initiator conducts further polymerization inside the polymer particles.

A water-soluble initiator is introduced into the aqueous phase where it reacts with monomers in the micelles (this aspect is different from suspension polymerization wherein an oil-soluble initiator dissolves in the monomers followed by the polymer formation in the monomer droplets themselves). The water-soluble initiator initiates polymerization and continues the polymerization in the micelles. Monomers migrate from the large monomer droplet to the micelles to sustain polymerization. Monomers in the micelles quickly polymerize and turn into polymer particles. An oil-soluble initiator conducts polymerization inside the polymer particles as described in the previous paragraph.

(9) Costanza et al. teach away from a polymerization at high temperatures and raising the temperature during emulsion polymerization because Costanza et al. explicitly suggest keeping the same temperature during the polymerization and below 80 °C.

Thus, Costanza et al. do not make the claimed process obvious.

Accordingly, it is respectfully requested that this rejection be REVERSED.

Rejection 2: The rejection of Claim 5 under 35 U.S.C. 103(a) over Costanza et al., US 4,003,871 and Gluck et al., US 5,908,872.

The Examiner's decision must be reversed because the Examiner has not established that a person of ordinary skill in the art would have been motivated to modify emulsion polymerization of Costanza et al. with suspension (bulk) polymerization of Gluck et al.

The process Gluck et al. *verses* the process of Costanza et al.

(a) Gluck et al. describe a batch polymerization in aqueous suspension.

A polymerization mechanism in aqueous suspension is fundamentally different from the polymerization mechanism in emulsion (see "Rejection 1" with regard to emulsion polymerization). In aqueous suspension polymerization, such as in Gluck et al., both initiators are oil-soluble. The aqueous suspension polymerization proceeds in three steps. First, the oil-soluble initiators are dissolved into monomers and a monomers/initiators solution is formed. Second, the formed solution is dispersed in the aqueous phase and form small monomer droplets. Third, polymer particles are formed in the small monomer droplets themselves. Thus, the polymeric particles have the same size as the monomer droplets. There is no a micelle formation and a monomer migration through the aqueous phase from the large monomer droplets into the micelles to build up polymer particles, as in the emulsion polymerization.

Example 1-3 of Gluck et al. clearly show that suspension polymerization is fundamentally different from polymerization in emulsion. First, two oil-soluble initiators were added to styrene. The formed solution was dispersed in the aqueous phase. The reaction mixture was heated while the polymerization was conducted.

Thus, the mechanism of the Gluck et al. suspension polymerization is fundamentally different from that of emulsion polymerization of Costanza et al.

(b) Further, the Gluck et al. process comprises using only oil-soluble initiators (e.g., two peroxides that are active at different temperatures) that dissolve into monomer droplets followed by polymerization when the temperature is increased. In the Costanza et al. emulsion polymerization, both benzoyl peroxide (an *oil-soluble* initiator) and potassium persulfate (a *water soluble* initiator) active at the same temperature are used (e.g., see Example 3).

Thus, Gluck et al. and Costanza et al. use different initiator systems.

(c) In the Gluck et al. aqueous suspension polymerization, all monomer droplets are fed at the initial charge followed by polymerization at the increasing temperature. A surfactant is added only after 2.5 hours after starting the polymerization (e.g., see Example 1). In the Costanza et al. emulsion polymerization, monomers are fed into the reactor during the polymerization while the temperature is constant (e.g., 50 °C)

Thus, Gluck et al. and Costanza et al. are fundamentally different with regard to adding monomers, polymerization temperatures and other parameters.

One would not have been motivated to use a high temperature as in the Gluck et al. suspension (bulk) polymerization and also to raise a polymerization temperature during metering of monomers in the Costanza et al. emulsion polymerization with a reasonable expectation of achieving the claimed method because:

(i) a mechanism of the Gluck et al. suspension polymerization is fundamentally different from that of emulsion polymerization of Costanza et al. (e.g., the behavior of the components, monomer droplets and polymerization particles; a size and a function of the monomer droplets and polymerization particles; a growing polymeric chain location; temperatures; and initiators),

(ii) the Gluck et al. process comprises using only oil-soluble initiators (active at different temperatures), while in the Costanza et al. emulsion polymerization, both an oil-

soluble initiator and a water soluble initiators (that work at the same temperature) are used, and

(iii) in the Gluck et al. aqueous suspension polymerization, all monomer droplets are fed at the initial charge and monomers are not metered into a reactor while the polymerization temperature is increased.

Further, one would not have reasonably expected that using temperatures adjusted for specific organic peroxides A and B for an aqueous suspension polymerization process would have successfully produced Costanza et al.'s polymer in emulsion which is obtained with different initiators (water and oil soluble), by a different process and a different temperature.

For example, the Comparative Example in the present specification comprises an oil-soluble initiator and a water-soluble activator (feed III on page 20) which is a *water-in-oil bi-phase* initiator system (compare to the *oil-in-water* emulsion of the claimed process). The aqueous polymer dispersion obtained in the Comparative Example is inferior.

Thus, these examples clearly demonstrate that in different polymerization systems the desired polymers may not be produced.

In addition, Costanza et al. teach away from using high temperatures and increasing a temperature during emulsion polymerization because Costanza et al. explicitly suggest keeping the same temperature during the polymerization and below 80 °C.

Thus, Costanza et al. and Gluck et al. do not make the claimed method obvious.

Accordingly, it is respectfully requested that this rejection be REVERSED.

VIII. CONCLUSION

Appellants submit that in view of the deficiencies noted above, the decision of the Examiner must be reversed.

Respectfully submitted,

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IX. CLAIMS APPENDIX

Claim 1: A process for the preparation of an aqueous polymer dispersion by free radical aqueous emulsion polymerization comprising polymerizing at least one ethylenically unsaturated compound (monomer) in the presence of at least one dispersant, wherein

- a) into a reaction vessel at a temperature which is less than or equal to the starting reaction temperature T_S ,
- a₁) at least one portion of demineralized water,
- a₂) at least one portion of at least one oil-soluble free radical initiator,
- a₃) at least one portion of at least one dispersant,
- a₄) optionally, a portion of the at least one monomer and
- a₅) optionally, a portion of at least one water-soluble free radical initiator are initially added to form a reaction mixture in the reaction vessel, thereafter
- e) the reaction mixture obtained is, optionally, heated to the starting reaction temperature T_S , and thereafter
- f) the following are metered into the reaction mixture:
 - c₁) optionally, the remaining amount of demineralized water,
 - c₂) optionally, the remaining amount of the at least one oil-soluble free radical initiator,
 - c₃) optionally, the remaining amount of the at least one dispersant,
 - c₄) the total amount or, optionally, the remaining amount of the at least one monomer and
 - c₅) the main amount of the at least one water-soluble free radical initiator, and
- g) the reaction mixture is heated to an end reaction temperature T_E during the metering of the at least one monomer, and wherein

the at least one water-soluble free radical initiator has a solubility of $\geq 1\%$ by weight at 20°C and atmospheric pressure in demineralized water, and the at least one oil-soluble free radical initiator has a solubility of $< 1\%$ by weight under the process conditions and the total amount of water being such that the aqueous polymer dispersion obtained has a solids content of from 20 to 70% by weight,

the at least one water-soluble free radical initiator initiates a free radical polymerization reaction of the at least one monomer at the starting reaction temperature T_S , and

at least one oil-soluble free radical initiator has a half-life of ≥ 10 hours at the starting reaction temperature T_S and a half-life of ≤ 5 hours at the end reaction temperature T_E .

Claim 4: The process according to Claim 1, wherein $T_E \geq T_S + 10^{\circ}\text{C}$.

Claim 5: The process according to Claim 1, wherein T_S is from ≥ 30 to $\leq 120^{\circ}\text{C}$ and T_E is from ≥ 80 to $\leq 200^{\circ}\text{C}$.

Claim 6: The process according to Claim 1, wherein the amount of water-soluble and oil-soluble free radical initiator is in each case from 0.01 to 5% by weight, based on the total amount of monomer.

Claim 7: The process according to Claim 1, wherein the pressure during the polymerization is chosen so that the reaction mixture does not boil at any time.

Claim 8: The process according to Claim 1, wherein the at least one water-soluble free radical initiator used is a mono- or di-alkali metal or ammonium salt of peroxodisulfuric acid.

Claim 9: The process according to Claim 1, wherein the at least one oil-soluble free radical initiator used is at least one compound selected from the group consisting of tert-butyl peroxy-2-ethylhexanoate, tert-amyl peroxy-2-ethylhexanoate, tert-butyl peroxybenzoate, tert-amyl peroxybenzoate, tert-butyl peroxyacetate, tert-butyl peroxy-3,5,5-trimethylhexanoate, tert-butyl peroxyisobutanoate, tert-butyl peroxydiethylacetate, tert-butyl peroxy-pivalate, tert-butyl peroxyisopropylcarbonate, and tert-butyl peroxy-2-ethylhexylcarbonate.

Claim 10: The process according to Claim 1, wherein the reaction mixture is kept at the end reaction temperature T_E for at least a further 30 minutes after the end of the monomer metering.

Claim 11: The process according to Claim 1, wherein the reaction mixture is stripped with inert gas and/or steam after the end of the monomer metering.

Claim 14: The process according to Claim 1, wherein the dispersant is a protective colloid or an emulsifier.

Claim 15: The process according to Claim 1, wherein the total amount of the dispersant is from 0.1 to 5 wt.% based on the total amount of the monomer to be subjected to the free radical polymerization.

Claim 16: The process according to Claim 1, wherein an amount of water in a_1) is equal or less than 50 wt.% based on the total amount of water.

Claim 17: The process according to Claim 1, wherein an amount of the dispersant in a_3) is equal or less than 50 wt.% based on the total amount of the dispersant.

Claim 18: The process according to Claim 1, wherein the monomer is added in a_4) and an amount of the monomer is equal or less than 50 wt.% based on the total amount of monomer.

Claim 19: The process according to Claim 1, wherein the water-soluble free radical initiator is added in a_5) and an amount of the at least one water-soluble free radical initiator is equal or less than 30 wt.% based on the total amount of the water-soluble free radical initiator.

Claim 20: The process according to Claim 1, wherein an amount of the oil-soluble free radical initiator in a_2) is at least 50 wt.% based on the total amount of the oil-soluble free radical initiator.

Claim 21: The process according to Claim 1, wherein the metering of the at least one monomer is carried out from 10 minutes to 20 hours.

Claim 22: The process according to Claim 1, wherein the metering of the at least one water-soluble free radical initiator is carried out in such a way that at least 50 wt.% of the water-soluble free radical initiator is added during the monomer metering.

X. EVIDENCE APPENDIX

None

XI. RELATED PROCEEDINGS APPENDIX

None